NOTES ON SOME INDO-PACIFIC UPOGEBIIDAE WITH DESCRIPTIONS OF FOUR NEW SPECIES (CRUSTACEA : THALASSINIDEA).

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Ngoc-Ho, N. 1994 06 01: Notes on some Indo-Pacific Upogebiidae with descriptions of four new species (Crustacea: Thalassinidea). *Memoirs of the Queensland Museum* 35(1): 193-216. Brisbane. ISSN 0079-8835

Eleven species of Upogebiidae from New Guinea, New Caledonia, Kenya, Madagascar, Japan, Taiwan, Singapore and Vietnam have been studied. Four are new: *Gebiacantha multispinosa*, *G. lifuensis*, *Upogebia sakaii* and *U. spinimanus*. The seven additional species include: *Gebiacantha laurentae* Ngoc-Ho, *Upogebia narutensis* Sakai, *U. pugnax* de Man, *U. savignyi* (Strahl), *U. wuhsienweni* Yu, *Wolffogebia inermis* Sakai, *W. phuketensis* Sakai.□*Crustacea, Thalassinidea, Upogebiidae, new species, Indo-Pacific, taxonomy.*

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This work provides further information about the rich upogebiid fauna of the Indo-Pacific (de Man,1927,1928; Poore & Griffin,1979; Sakai,1982; Ngoc-Ho,1990). Collections examined come from: New Guinea (*Gebiacantha laurentae* Ngoc-Ho); New Caledonia (*G. multispinosa* sp.nov., *G. lifuensis* sp. nov., *Upogebia pugnax* de Man); Kenya (*U. savignyi* (Strahl); Madagascar (*U. spinimanus* sp. nov.); Japan (*U. sakaii* sp. nov.); Singapore (*Wolffogebia phuketensis* Sakai); Taiwan (*U. narutensis* Sakai, *U. wuhsienweni* Yu); and Vietnam (*W. inermis* Sakai) The latter species was previously known only from the holotype which cannot be located. Its examination, together with that of *W. phuketensis*, adds generic features of *Wolffogebia* unmentioned by Sakai (1982).

New material of *Upogebia savignyi* confirms its synonymy with *U. rhadames* Nobili (Sakai, 1982). The first available adult female of *U. pugnax* described in this work gives further information about this species. *U. narutensis* and *U. wuhsienweni*, both reported for the first time from Taiwan, are very similar to each other and also to Taiwanese *U. edulis* Ngoc-Ho & Chan,1992.

Measurements given (mm) in the descriptions are: carapace length (cl.) = tip of the rostrum to the posterior border of the carapace; total length (tl.)= tip of the rostrum to the posterior border of the telson. Terminology of descriptions follows Ngoc-Ho (1981).

ABBREVIATIONS USED: BMNH, British Museum (Natural History), London; MNHN, Musèum National d'Histoire Naturelle, Paris; NNML, Nationaal Natuurhistorisch Museum, Leiden; NTOU, National Taiwan Ocean University; QM, Queensland Museum, Brisbane; UMK, Universitetets Zoologiske Museum, Kobenhavn; USNM, U.S. National Museum, Washington, D.C.; ZSM, Zoologische Staatssammlung, München.

SYSTEMATICS

Family UPOGEBIIDAE Borradaile, 1903
Gebiacantha Ngoc-Ho, 1989
Gebiacantha laurentae Ngoc-Ho, 1989
(Fig. 1)

Gebiacantha laurentae Ngoc-Ho, 1989: 140, fig. 9.

MATERIAL EXAMINED

Sek Harbour, New Guinea, St. 62, 37m, mud with a little sand, W. Stephenson coll., 17.10.1969: ♀, cl. 7.5mm, tl. 18.5mm (QMW3317).

DISTRIBUTION

Indonesia (Makassar Detroit) and now Papua New Guinea. This record marks an easterly range extension.

REMARKS

The specimen examined agrees well with the female paratype of the species though it is slightly larger and has all spines comparatively more prominent. It also has 2 ventral spines on the 4th article of the antenna while the type has only one. The specimen is covered with mud and sediments although the area is dominated by soft corals and sponges (P. Davic, pers. comm.). Nothing is known of its ecology.

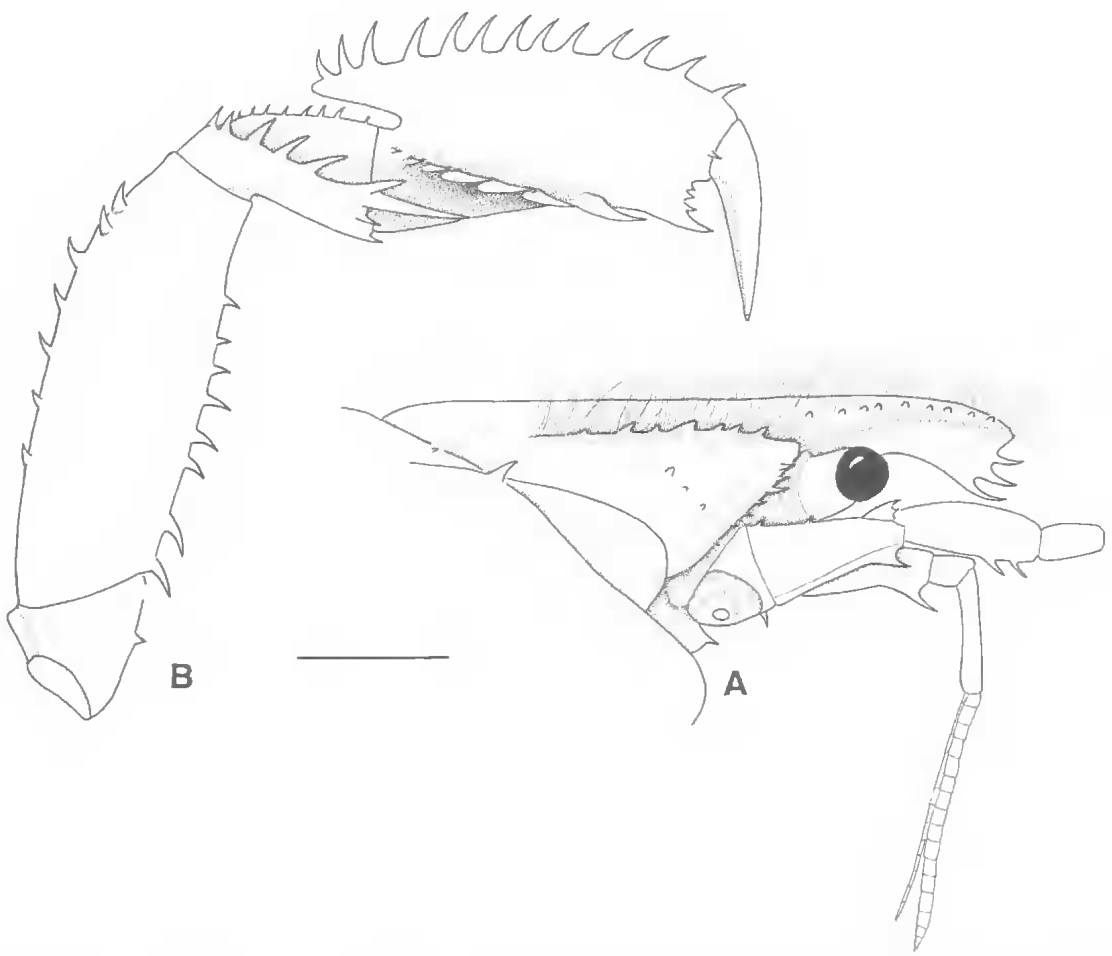

FIG 1. *Gebiacantha laurentae* Ngoc-Ho, female, QMW3317. A, anterior part of carapace, lateral view; B, first pereopod, mesial view. Scale line: 1mm.

Gebiacantha multispinosa sp. nov.
(Fig. 2)

MATERIAL EXAMINED

HOLOTYPE: New Caledonia: Loyalty Islands (Ouvéa), J.P. Menou coll., 16.11.1991, depth 6-10m: ovigerous ♀ ,cl. 11.5mm, tl. 32.5mm (MNHNTh1255).

PARATYPE: same data as holotype, ovigerous ♀ : cl. 10.5mm, tl. 28.5mm (MNHNTh1256).

ETYMOLOGY

Referring to the numerous spines present on the body and pereopod 1.

DESCRIPTION

Rostrum triangular, projecting far beyond eyes, with 6-7 spiniform dorsal teeth on each lateral border; 3 large ventral spines. Fine and faint medio-dorsal groove (slightly dilated anteriorly) on rostrum and anterior part of gastric region, followed posteriorly by bare, unarmed, longitudinal, low elevation. Lateral groove moderately broad, lateral ridge with 9-10 spiniform teeth or tubercles. Linea thalassinica distinct, extending to posterior border of carapace. Anterolateral border of carapace with 5-6 spinules. Anterolateral region of carapace (limited anteriorly and dorsally by anterolateral border and lateral ridge, posteriorly by linea

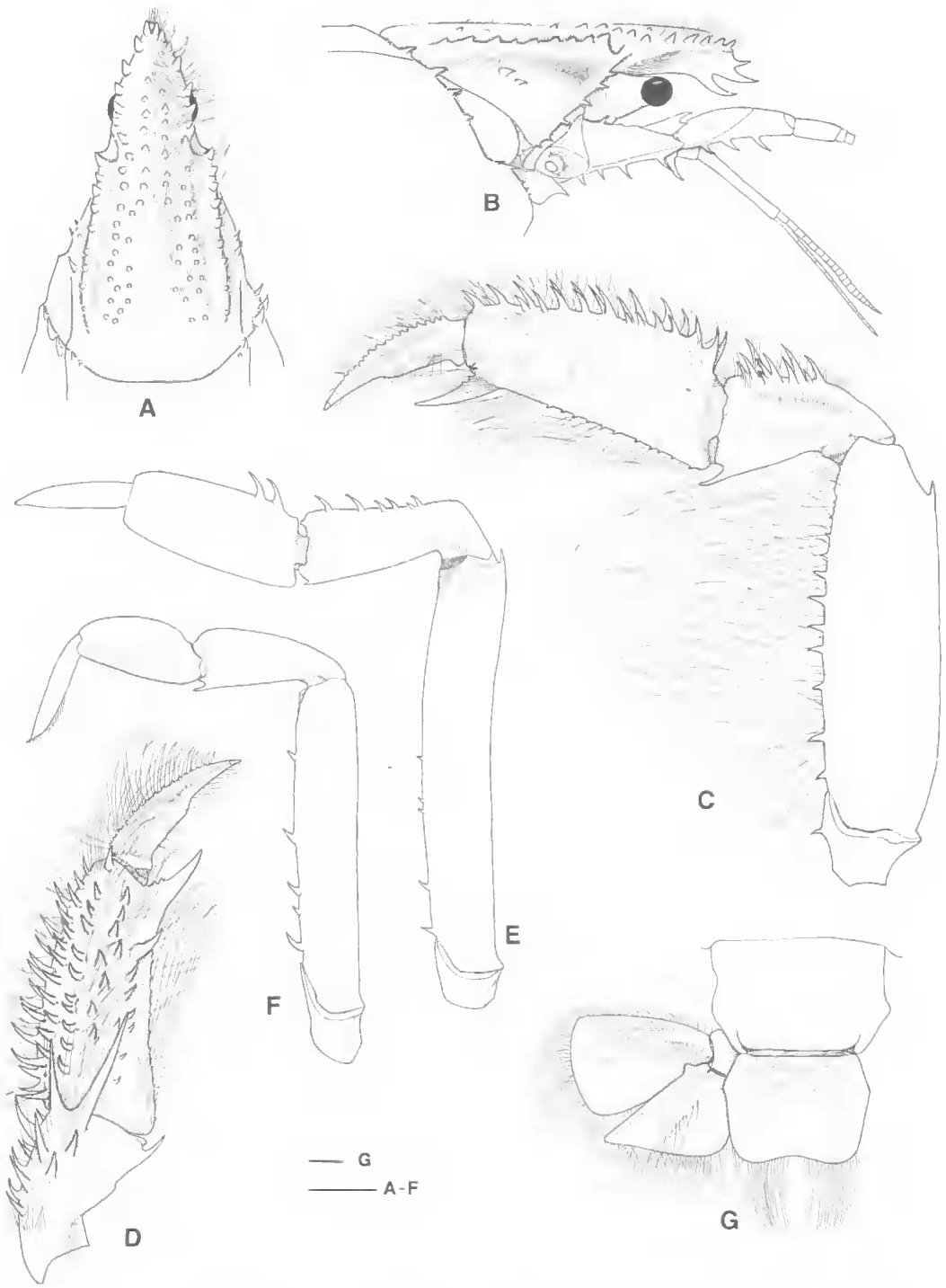

FIG. 2. *Gebiacantha multispinosa* sp. nov., holotype, ovig. female, MNHNTh1255. A,B, anterior part of carapace, dorsal and lateral view; C, pereopod 1, external view; D, distal part of pereopod 1, mesial view; E,F, pereopods 2 and 3 respectively; G, telson and uropod. Scale line: 1mm.

thalassinica) with 2-4 spines and spinules. Cervical groove deep, bearing 5 proximal spines and 2 distal spinules on either side. Epistome terminates dorsally in spinule.

Telson approximately 1.4 times as broad as long, lateral borders convex, postero-lateral angles rounded, posterior border concave medially, very faint inverted U-shaped carina on dorsal surface.

Antennule. (Fig. 2B). First peduncular article with large ventro-distal spine.

Antenna. (Fig. 2B). First, third and fourth peduncular articles with 1, 3 and 3 ventral spines respectively; second article with dorsal spine, scale terminating in 2 spinules.

Pereopod 1. Subcheliform. Ischium with ventral spine. Merus over 3.5 times as long as broad, bearing dorsal subdistal spine and 11-12 ventral spines. Carpus with fine longitudinal groove on upper part of external surface, ventral subdistal spine, 2 large mesial subdistal spines, and 11-13 spines or spinules along or near dorsal border. Propodus over twice as long as broad with spinules on proximal two-thirds of ventral margin; external surface with small ventro-distal spinule between base of fixed finger and dactylus; mesial surface bearing roughly 6 longitudinal rows of 8-10 spines, 4 lower rows distinct, upper 2 with spines more or less mixed up; large lower spine behind fixed finger, smaller upper one near base of dactylus; fixed finger about half as long as dactylus, bearing 2-3 small proximal teeth. Dactylus over half as long as propodus, with tubercles along upper border; cutting edge with small triangular flat tooth near mid-length; corneous tip.

Pereopod 2. Merus over 5 times as long as broad, dorsal distal spine, 4-5 ventral spines and spinules. Carpus with ventral subdistal spinule and 6 spines along dorsal margin. Propodus approximately rectangular, over twice as long as broad, 1-2 proximal dorsal spines.

Pereopod 3. Merus over 5 times as long as broad, 5-6 ventral spines. Carpus with ventral distal spine. Propodus with faint longitudinal carina on lower half. Dactylus with comb-like setae on distal half of ventral border.

Uropod. Exopod a little longer than telson, posterior border nearly straight, not continuous with lateral external border; endopod approximately triangular, protopod with spinule.

TYPE LOCALITY

New Caledonia (Loyalty Islands), 6-10m.

REMARKS

This species is similar to *G. lifuensis* sp. nov. described below and both are similar to *G. acanthochela* (Sakai, 1967) from Japan. The comparison is made under *G. lifuensis*.

Gebiacantha lifuensis sp. nov.
(Fig. 3)

MATERIAL EXAMINED

HOLOTYPE:New Caledonia: Loyalty Islands (Ouvéa), J.P. Menou coll., 16.11.1991, depth 6-10m: ovigerous ♀, cl. 11.5mm, tl. 33mm (MNHNTh1257).

ETYMOLOGY

From the type locality, Loyalty Islands.

DESCRIPTION

Rostrum approximately oval, projecting far beyond eyes, bearing 6-8 spiniform teeth on each convex lateral border; 4 large ventral spines. Short and faint medio-dorsal groove on rostrum; rounded tubercles in longitudinal rows on posterior part of rostrum, gastric region, and alongside lateral groove. Gastric ridge with 9-10 spiniform teeth. Anterolateral border of carapace with 5 spinules. Cervical groove distinct, shoulder lateral to it bearing spine near intersection with linea thalassinica, latter extending to posterior border of carapace.

Telson about 1.4 times as broad as long, lateral border convex, posterolateral angles rounded, posterior border concave medially, very faint inverted U-shaped carina on dorsal surface.

Antennule (Fig. 3B). First peduncular article with 1-2 ventral spines.

Antenna (Fig. 3B). First, third and fourth peduncular articles carrying 1, 3 and 3 spines respectively; scale terminating in 2 spinules.

Pereopod 1. Subcheliform. Ischium with ventral spine. Merus nearly 4 times as long as broad, with single upper subdistal spine; 6 spines and 2 spinules on lower border. Carpus with shallow longitudinal groove on external surface; ventral distal spine; 3 large subdistal spines (1 dorsal and 2 mesial); 8-9 smaller spines along, or near, dorsal border. Propodus about 2.5 times as long as broad, with a few proximal tubercles on ventral border and large spine on distal third near base of fixed finger; dorsal border with row of 9 spines; mesial surface provided in addition with 3 longitudinal rows of 8, 4, 3 spines respectively from upper to lower, and subdistal spine near articulation with dactylus; fixed finger about half as long as dactylus, unarmed. Dactylus slightly over half

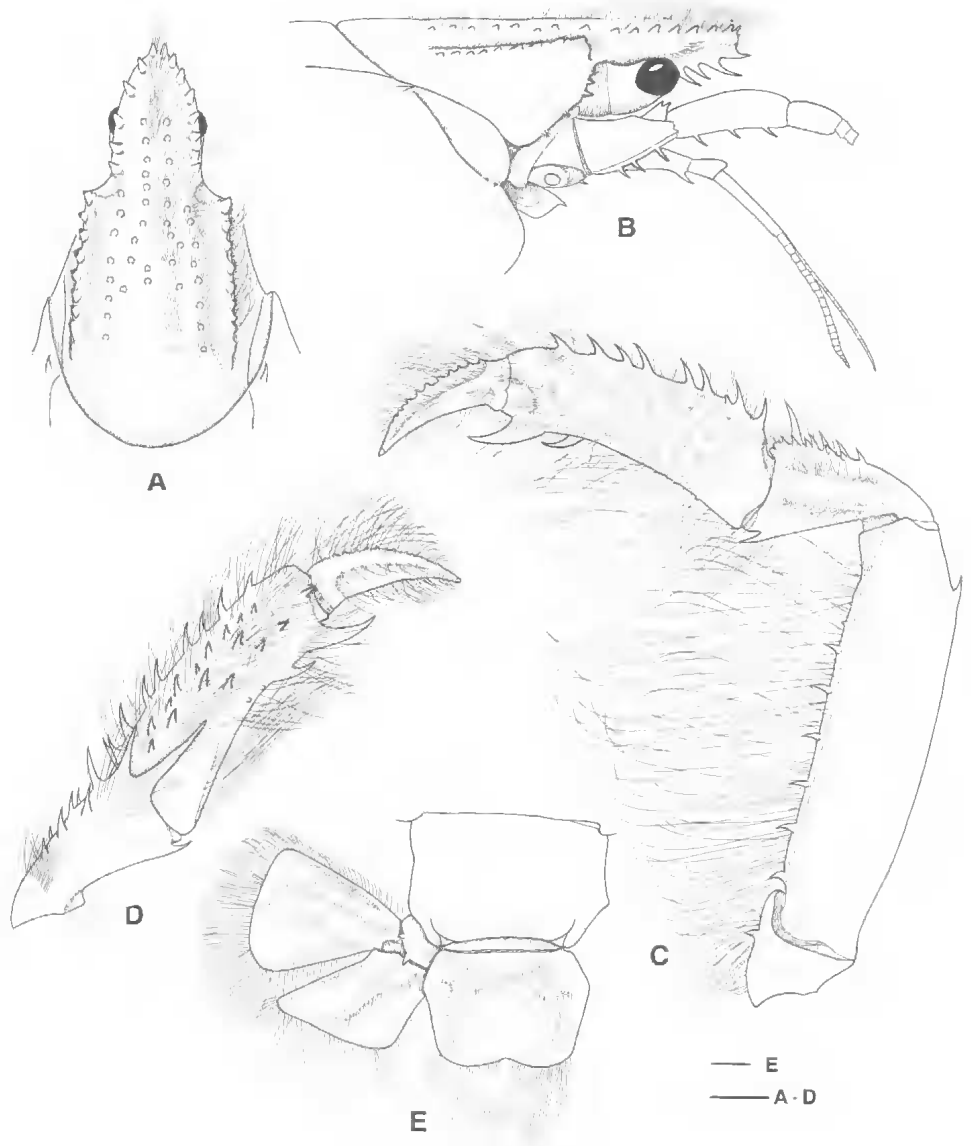

FIG. 3. *Gebiacantha lifuensis* sp. nov., holotype, ovig. female, MNHNTh1257. A,B, anterior part of carapace, dorsal and lateral view; C, pereopod 1, external view; D, distal part of pereopod 1, mesial view; E, telson and uropod. Scale line: 1mm.

as long as propodus with small tubercles on dorsal border, cutting edge unarmed.

Uropod. Exopod a little longer than telson, posterior border almost straight, meeting nearly at right angle with external lateral border; endopod approximately trapezoidal; protopod with spinule.

TYPE LOCALITY

New Caledonia (Loyalty Islands), 6-10m.

TABLE 1. Differentiating characters between *G. acanthochela* Sakai, *G. multispinosa* sp.nov. and *G. lifuensis* sp.nov.

	G. acanthochella	*G. multispinosa*	*G. lifuensis*
Rostrum	oval	triangular	oval
Infrarostral spines	2-3, small	3, large	4, large
Spines on antero-lateral region of carapace	absent	2-4	absent
Spinules on atnero-lateral border of carapace	7	6	5
Spines on lateral shouler of cervical groove	1	5	1
Peduncle of a2: -spinules on 2nd article -ventral spines on 3rd article	 2-3 2	 1 3	 absent 3
Pereopod 1 propod: -ext. spines btn base of fixed finger & dactyl -mesial spines -cutting edge of fixed finger	 absent 4 rows, 9-12 spines each narmed	 1 6 rows, 7-12 spines each 2 teeth	 absent 4 rows, 3-9 spines each narmed
Pereopod 1 dactylus: -cutting edge -upper border	 convex 3 proximal tubercles	 convex tubercles along whole length	 straight tubercles along whole length
Telson	Slightly broader than long	1.5 times as broad as long	1.5 times as broad as long

REMARKS

This species is closely related to *G. multispinosa* captured at the same locality. It differs from the latter by: 1, shape of rostrum; 2, anterolateral region of carapace unarmed; 3, presence of single spine only on each lateral shoulder of cervical groove; 4, absence of small external distal spine on pereopod 1, between base of fixed finger and dactylus; 5, mesial surface of pereopod 1 with fewer spines; 6, fixed finger of pereopod 1 unarmed; 7, no tooth on cutting edge of pereopod 1 dactylus.

Both *G. multispinosa* and *G. lifuensis* are similar to *G. acanthochela* (Sakai) from Japan in the length and shape of their uropods, the slight median concavity of their telson, the numerous mesial spines on pereopod 1 propod. Their differences are listed in Table 1.

Upogebia Leach, 1814.
Upogebia narutensis Sakai, 1986
(Figs 4; 5A-D)

Upogebia spinifrons (Haswell, 1882): Sakai, 1984: 209, figs 1-3.
Upogebia narutensis Sakai, 1986: 25, pl. 1.

MATERIAL EXAMINED

HOLOTYPE: Naruto, Japan, M. Shimoizumi coll., date unknown: ♂, cl. 26mm, tl. 96mm (NNML36777).

OTHER MATERIAL: Peng-Hu Island (West of Taiwan), T-Y. Chan coll., 1 October 1992: 1 ♂, cl. 19.5mm, tl. 60mm (MNHNTh1258); 1 ♂, cl. 19mm, tl. 59mm, 1 ♀, cl. 18mm, tl. 58mm (MNHNTh1259); 1 ♂, cl. 19mm, tl. 58mm, 1 ♀, cl. 18mm, tl. 57mm (MNHNTh1260); 2 ♂, cl. 18mm and 19mm, tl. 52mm and 58mm; 2 ♀, cl. 17mm and 17.5mm, tl. 52mm and 53.5mm (NTOU).

DESCRIPTION

Rostrum egg-shaped, projecting far beyond eye, with 1-3 small proximal tubercles on either lateral margin and the rest unarmed; 5 small ventral spines. Deep medio-dorsal groove on rostrum and anterior part of gastric region. Few small tubercles on gastric region most of them alongside moderately broad lateral groove. Lateral ridge divided by weak mid-dorsal notch: anterior half very setose dorsally with proximal tubercle and 2 spines at tip; posterior half with 3-4 spiniform or tuberculiform teeth. Anterolateral border of carapace bearing 4 spines. Linea thalassinica distinct. Cervical groove deep and continuous, shoulders lateral to it armed with

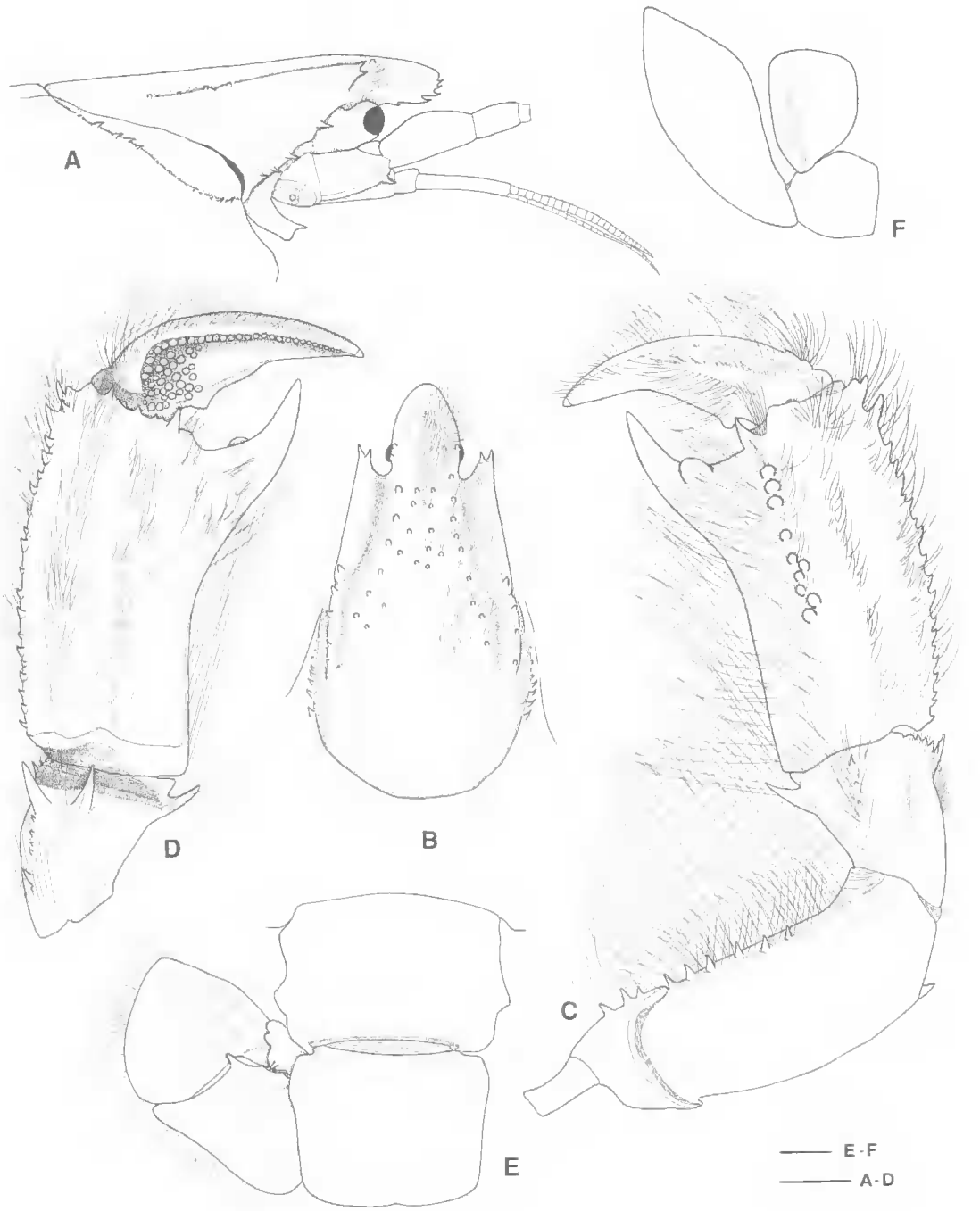

FIG. 4. *Upogebia narutensis* Sakai, male, MNHNTh1258. A,B, anterior part of carapace, lateral and dorsal view; C, pereopod 1, external view; D, distal part of pereopod 1, mesial view; E, telson and uropod; F, pleopod 2. Scale line: 2mm.

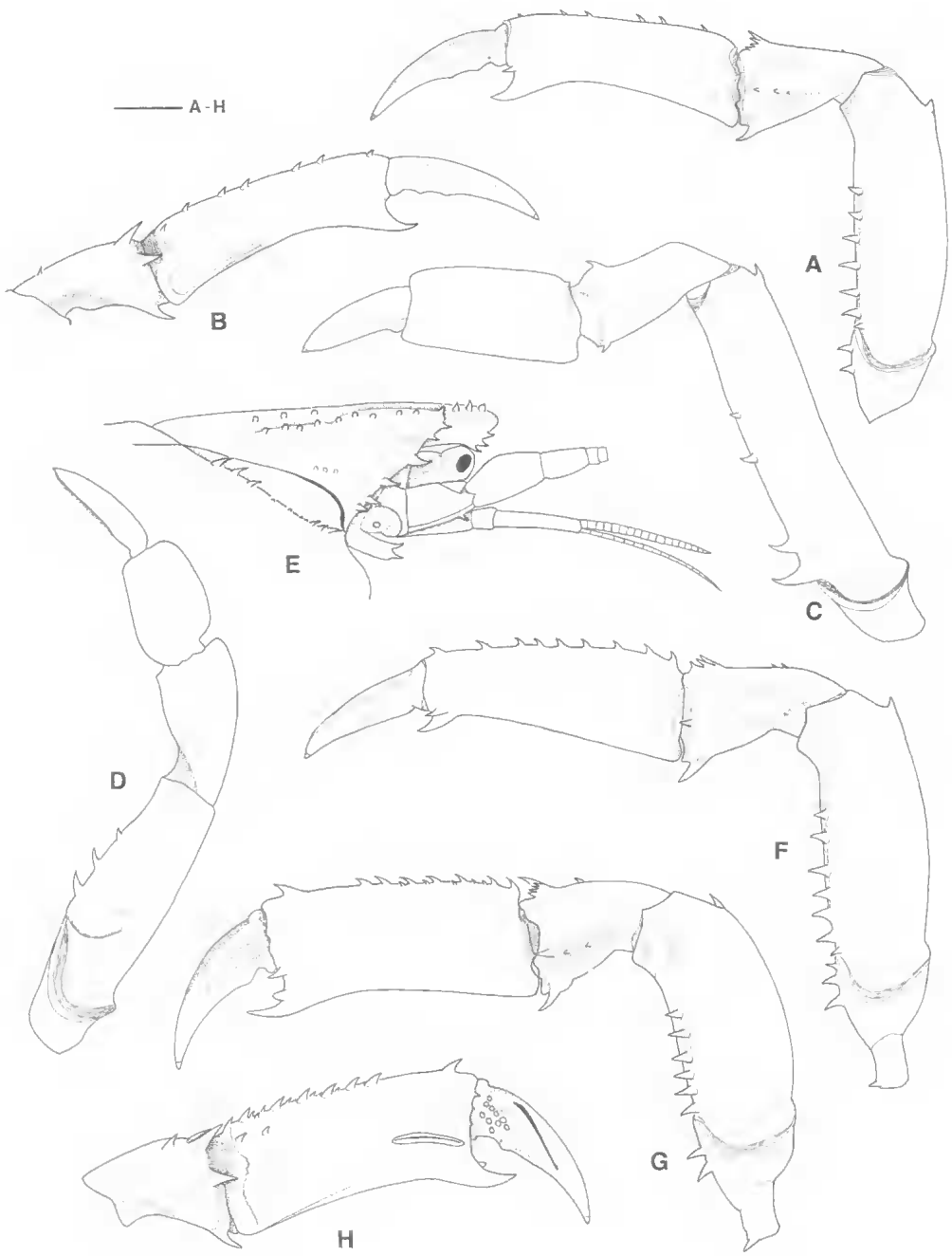

FIG. 5. A-D, *Upogebia narutensis* Sakai. A,B, female; C,D, male, MNHNTh1258, MNHNTh1259; E-H, *Upogebia wuhsienweni* Sakai. E,G,H, male; F, female, MNHNTh1265. A,F,G, pereopod 1, external view; B, H, distal part of pereopod 1, mesial view; C,D, pereopods 2 and 3 respectively; E, anterior part of carapace, lateral view. Scale line: 2mm.

spinules and tubercles. Arthrobranchs with a series of large lamellae on either side of rachis.

Telson approximately 1.3 times as broad as long, posterior margin slightly convex, very faint inverted U-shaped carina dorsally.

Antennule (Fig. 4A). Peduncle unarmed.

Antenna (Fig. 4A). Third peduncular article with small ventral subdistal spine, scale terminating in blunt tip.

Mandible. Without mesio-anterior tooth.

Maxillipeds. 1 and 3 both with epipod.

Pereopod 1. Subcheliform, sexually dimorphic, much stouter in males. Ischium with 2-3 ventral spines. Merus with dorsal subdistal spine and 5-7 ventral spines. Carpus with large ventral spine; lower half of outer surface with longitudinal crest of more or less conspicuous spinules terminating with largest one; upper half with fine longitudinal groove; carpal dorsal margin carrying 5-6 spines or spinules, and large dorsal subdistal spine at tip; 3-4 dorsal subdistal spinules external to the latter and large distal spine on upper half of mesial surface.

In males (Fig. 4C,D), palm of propodus about 1.5 times as long as broad at mid-length, broader distally; row of 12-20 spinules on dorsal margin; outer surface with ventral longitudinal row of strong round tubercles on distal half and large acute distal spine near lower base of dactylus; mesial surface bearing spinules on distal border with large distal spine near lower base of dactylus; fixed finger distal, nearly two-thirds as long as dactylus, cutting edge bearing large round tooth on external surface. Dactylus two-thirds as long as propodus with 2 proximal tubercles on dorsal border and shallow longitudinal dorsal groove on external surface; mesial surface with curved tuberculate dorsal crest and proximal round tubercles underneath; cutting edge with large proximal tooth and corneous tip.

In females (Fig. 5A,B), palm of propodus approximately 3.5 times as long as broad at mid-length and about as broad proximally as distally, unarmed except for row of 7 spinules on dorsal margin and external ventral distal spine between base of dactylus and fixed finger; fixed finger about one-fourth as long as dactylus, unarmed. Dactylus with corneous tip and shallow longitudinal dorsal groove on external surface, cutting edge with 2 minute flat teeth.

Pereopod 2. Merus with dorsal distal spine and 4-5 ventral spines, the 2 proximal of which are large. Carpus bearing ventral and dorsal subdistal spine.

Pereopod 3. Merus carrying 3 ventral spines and 1 or 2 transversal proximal rows of short setae.

Males with genital openings on coxae of both P3 and P5. Females with genital opening on coxa of P3.

Pleopod 2-5 (Fig. 4F). Endopod approximately quadrate with weak longitudinal carina.

Uropod. Latero-external and posterior margin of exopod, both slightly convex, meeting nearly at a right angle exteriorly. Latero-external margin of endopod with proximal shoulder terminating in large blunt tooth. Protopod with spinule hanging over base of endopod.

DISTRIBUTION

Naruto (Japan), Taiwan.

REMARKS

This material fits very well with the description and figures given by Sakai (1984, 1986) and also with the holotype examined, except for the mesial proximal tubercles of P1 dactylus that are more prominent and numerous.

The holotype of *U. narutensis* was once assigned to *U. spinifrons* (Haswell) (Sakai, 1984). Differences between the two were given by Sakai (1986). *U. narutensis* is also very similar to *U. edulis* Ngoc-Ho & Chan, 1992 as well as to *U. wuhsienweni* Yu, 1931, all three reported from Taiwan. They all have the endopod of pleopods 2-5 in an unusual quadrate shape (Fig. 4F) which may exist in other species but have been overlooked by authors; it was not reported in the original description of *U. edulis* (Ngoc-Ho & Chan, 1992).

U. narutensis resembles *U. edulis* by the unarmed anterior part of the gastric ridges, the stoutness of the male pereopod 1 and the large tooth on the cutting edge of the dactylus. It is similar to *U. wuhsienweni* in the shape of the rostrum, in the male pereopod 1 bearing a large round tooth on the cutting edge of the distal fixed finger. It differs from both *U. edulis* and *U. wuhsienweni* by the following features: 1, anterior half of the rostrum unarmed; 2, absence of a stridulating ridge on the propodus of the male pereopod 1; 3, latero-external margin of the uropod endopod with a large blunt tooth on the proximal shoulder.

In these three species of *Upogebia*, female pereopods 1 are hardly distinguishable. That of *U. narutensis* can be differentiated by the shape of its propod which is as broad distally as proximally while it is narrower distally in *U. edulis* and *U. wuhsienweni*.

Upogebia wuhsienweni Yu, 1931
(Fig. 5E-H)

Upogebia Wuhsienweni Yu, 1931: 89, fig. 2.
Upogebia wuhsienweni: Liu, 1955: 68, figs 7-12; Ngoc-Ho & Chan, 1992: 38, fig. 4; not Sakai, 1993: 92, figs 1, 2 (= *U. edulis* Ngoc-Ho & Chan).
Upogebia (Upogebia) wuhsienweni: Sakai, 1982: 59 (in part, not figs 11d, 12f-g, 13g-h, pls G1-2 and material USNM59070, 59071, 59072, 59073 (= *Upogebia edulis* Ngoc-Ho & Chan).

MATERIAL EXAMINED
How-Long, Northwestern Taiwan: 1 ♂, cl. 17mm, tl. 52mm; 1 ♀, cl. 19.5mm, tl. 60mm (MNHNTh1265).

DESCRIPTION
Rostrum rounded anteriorly, projecting beyond eyes, bearing 5-6 spiniform teeth on each lateral border, ventral surface with 3 spines. Gastric ridge divided by weak mid-dorsal notch: anterior half with 5-7 round teeth and spine at tip; posterior half with 4-5 teeth. Anterolateral border of carapace bearing 6-7 spines or spinules. Cervical groove deep, shoulders lateral to it armed with spinules and tubercles. Epistome terminating in 2 spinules. Arthrobranchs with large lamellae on either side of rachis.

Antennule (Fig.5E). Peduncle unarmed.

Antenna (Fig. 5E). Third peduncular article with small ventral subdistal spine, scale terminating in blunt tooth.

Mandible. Without mesio-anterior tooth.

Maxillipeds. 1-3 with epipod.

Pereopod 1. Subcheliform. Basis with sharp ventral spine. Ischium carrying 2-3 ventral spines. Dorsal subdistal spine and 6-7 ventral spines on merus. Carpus bearing longitudinal crest on external lower half with more or less conspicuous spinules and terminating in spine; large ventral distal spine, large dorsal distal spine along with 3-4 dorsal external spinules, large distal spine near middle of mesial surface; dorsal margin with 1-2 spines.

In males, propodus slightly broader distally than proximally with dorsal row of 8-9 spines and 8 spinules; external distal spines between base of dactylus and fixed finger; mesial surface bearing 2 proximal dorsal spines below dorsal row and slender elliptic stridulating ridge on ventral distal half; fixed finger distal, about one-third as long as dactylus, carrying large rounded external tooth near middle of cutting edge. Dactylus with corneous tip, shallow longitudinal dorsal groove on external surface; longitudinal oblique carina on mesial surface alongside fine corneous one and a few round proximal tubercles. In female, propodus narower distally than proximally with dorsal row of 9 spines, external distal spine between base of dactylus and fixed finger; fixed finger short, hardly one-fourth length of dactylus, unarmed. Dactylus with corneous tip and shallow longitudinal dorsal groove on external surface.

DISTRIBUTION
North China, Western Taiwan. This record marks a southerly range extension.

REMARKS
The present specimens from Taiwan agree closely with the material of *U. wuhsienweni* from China examined previously (Ngoc-Ho & Chan, 1992) with the following exceptions: the male pereopod 1 is more slender, being about twice as long as broad at mid-length and the female pereopod 1 carries a distal external spine between the base of the dactylus and fixed finger, that is usually missing on Chinese specimens.

U. wuhsienweni differs from *U. edulis* Ngoc-Ho & Chan by many characters (Ngoc-Ho & Chan, 1992) especially by the anterior half of its gastric ridges armed with spines, and these are clearly shown on the original figure given by Yu (1931: fig. 11A); in *U. edulis*, the same part of the gastric ridges is unarmed. All material assigned to *U. wuhsienweni* by Sakai (1982, 1993) but having an unarmed anterior half of the gastric ridges is likely to belong to *U. edulis*. Female pereopods 1 of *U. wuhsienweni* and *U. edulis* are hardly distinguishable except for a sharp spine on the basis in the former species that is replaced by a blunt tooth in the latter.

Upogebia pugnax de Man, 1905
(Fig. 6)

Upogebia (Upogebia) pugnax de Man, 1905: 600; de Man, 1928: 66, fig. 8-8e, 8f; Sakai, 1982: 52 (in part, not fig. 11b, pl E4, E6); not Sakai, 1984: 161 (= *U. fallax* de Man) and 1987: 302 (=*Upogebia sakaii* sp. nov.).
Upogebia pugnax: Ngoc-Ho, 1990: 987, fig. 7; 1991: 305, fig. 10.

MATERIAL EXAMINED
New Caledonia: Loyalty Islands (Ouvéa), J.P. Menou coll., 18.11.1991, 9-11 m: 1 ovigerous ♀, cl. 10.5mm, tl. 31.5mm (MNHNTh1261).

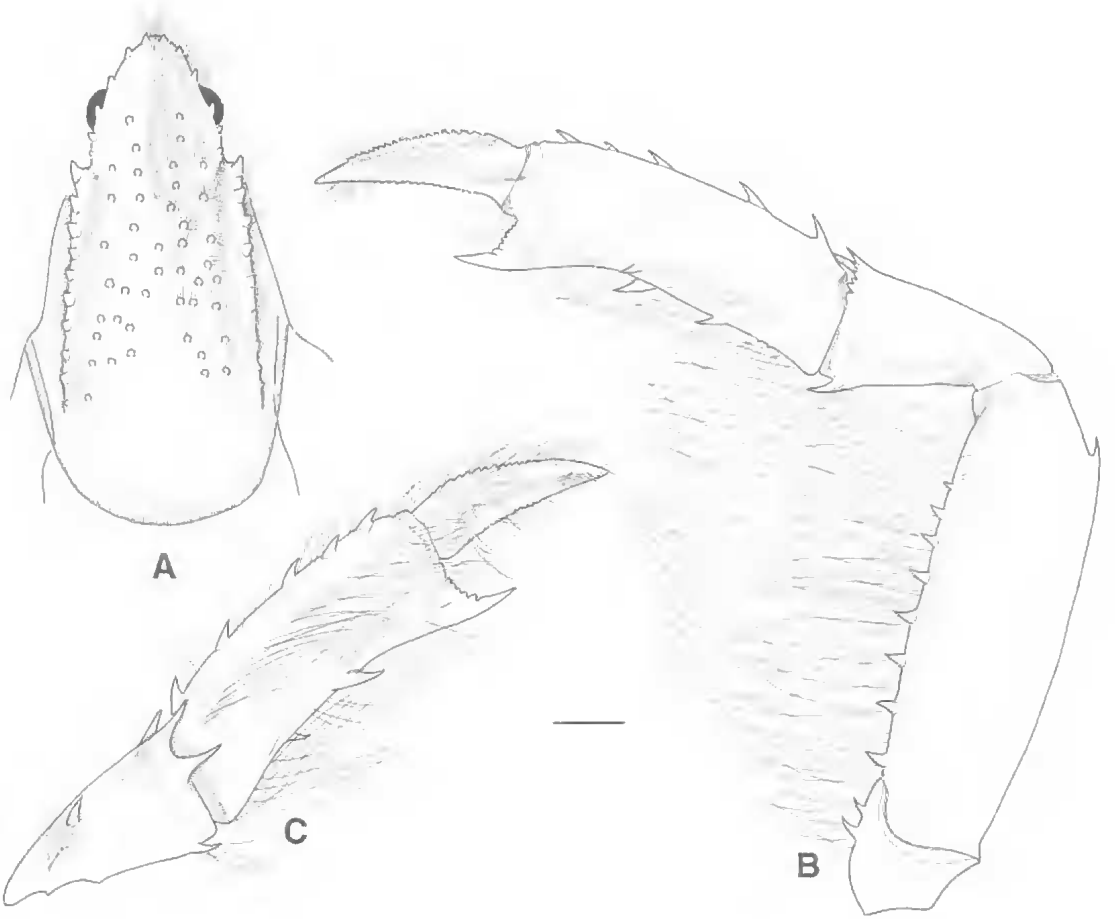

FIG. 6. *Upogebia pugnax* de Man., ovig. female, MNHNTh1261. A, anterior part of carapace, dorsal view; B, pereopod 1, external view; C, distal part of pereopod 1, mesial view. Scale line: 1mm.

DESCRIPTION

Rostrum about as long as broad at base, overreaching eyes, with 6 small teeth on either lateral border and slight median groove; proximal part of rostrum and anterior part of gastric region carrying round tubercles. Lateral groove moderately wide, lateral ridge with 10 teeth. Cervical groove deep, anterolateral border of carapace with spinule.

Pereopod 1. Subcheliform. Ischium with 2 ventral spines. Merus over 3 times as long as broad with dorsal subdistal spine and 8 ventral spines. Carpus with ventral spine and spine near middle of dorsal margin; external surface with dorsal distal spine and spinule, mesial surface with large dorsal distal spine and another near middle of distal margin. Propodus over 3 times as long as broad, carrying spine near proximal third and large spine near middle of ventral margin, with smaller one beside the latter on external surface; upper border with 5 large spines; fixed finger approximately triangular, bearing small rounded teeth on cutting edge. Dactylus about two-third as long as propodus with corneous tip, upper border and cutting edge finely denticulated, faint longitudinal groove near upper border of external surface.

Genital openings on coxae of both pereopods 3 and 5.

Pleopod 1 present.

DISTRIBUTION

Indonesia (Sumbawa), New Caledonia (St Marie Island, Loyalty Islands) (significant southerly range extension).

REMARKS

This is the first female reported for the species and it agrees well with other described material (de Man, 1928; Ngoc-Ho, 1990, 1991). It confirms that the two specimens from New Caledonia described by Ngoc-Ho (1991) are male.

With male and female adults now known, the following characteristics of *U. pugnax* can be noted: 1, Male pereopod 1 is dimorphic and can be "stout" or "slender", the latter type being very similar to that of the female. The same has been reported in *U. edulis* Ngoc-Ho & Chan (1992); 2, Males and females possess genital openings on coxae of both pereopods 3 and 5; only females possess pleopod 1; 3, The holotype (see de Man, 1928; Ngoc-Ho, 1990) is a young male of 18.5mm total length and has a "slender" type pereopod 1.

Upogebia sakaii sp. nov.
(Fig. 7)

MATERIAL EXAMINED

HOLOTYPE: Japan (Usa - Inoshiri, Kochi), K. Sakai coll., 20.5.1990, coarse sand, tidal zone: ♂, cl. 9.5mm, tl. 24.5mm (MNHNTh1262).

PARATYPES. 1 ♂, cl. 10mm tl. 22mm, 1 ♀, cl. 9mm tl. 21.5mm (MNHNTh1263); 3 ♂, cl. 9-11mm, tl. 23-28mm; 4 ♀, cl. 8.5-9.5mm, tl. 21-25mm (MNHNTh1264).

ETYMOLOGY

For Dr. K. Sakai who collected and donated this material.

DESCRIPTION

Rostrum sub-triangular, c. 1.2 times as long as broad at base, with 6 or 7 lateral spiniform teeth, slight longitudinal median groove; round tubercles on rostrum and anterior part of gastric region. Lateral groove moderately broad, lateral ridge with 9 or 10 teeth. Antero-lateral border of carapace with spinule. Cervical groove deep, linea thalassinica distinct, extending to posterior margin of carapace.

Telson slightly shorter than 6th abdominal segment, lateral border convex at proximal third, posterior border concave medially and about 2/3 as broad as proximal; very faint inverted U-shaped carina on dorsal surface.

Arthrobranchs with one series of large tubular lamellae on either side of rachis.

Antennule (Fig. 7B). First peduncular article with large ventral subdistal spine.

Antenna (Fig. 7B). Third peduncular article with large ventral subdistal spine; scale not demarcated from peduncle, terminating in spinule.

Mandible. With large antero-mesial tooth.

Maxillipeds. 3 with small epipod.

Pereopod 1. Subcheliform, sexually dimorphic, stouter in males. Ischium with ventral spine. Merus 2.5 times as long as broad, bearing spine near distal quarter of dorsal margin, 7-10 ventral spines. Carpus with large ventral subdistal spine and spine near middle of dorsal margin; 3 dorsal distal (2 external, 1 mesial) spines and large spine near middle of mesial distal margin. Propodus over twice as long as broad, with 5 large dorsal spines and large ventral spine behind fixed finger; external surface with tubercles on lower third and one or 2 spinules near large ventral spine; mesial surface bearing 1-2 dorsal subdistal spines, near upper part of articulation with dactylus; fixed finger, broad and short, cutting edge with rounded teeth over proximal two-thirds. Dactylus about two-thirds length of propodus carrying faint longitudinal dorsal groove on external surface, cutting edge dentate on proximal half, with low triangular tooth near middle; tip corneous.

Female pereopod 1 with same spinulation as in males but more slender, merus and propodus about 3 and 2.5 times as long as broad respectively.

Pereopod 2. Merus with subdistal dorsal spine; 2 proximal spines on ventral border. Carpus bearing subdistal dorsal and subdistal ventral spine. Dactylus with faint longitudinal dorsal groove.

Pereopod 3. Merus with 3 ventral spines and a few tubercles on ventral margin. Subdistal ventral spine on carpus. Dactylus with comb-like setae on ventral margin.

Pereopod 4. Merus with 4-5 spiniform tubercles on ventral margin.

Males are provided with genital opening on coxae of pereopod 5, females have openings on coxae of both pereopods 3 and 5. Large coxal spine on pereopod 1, smaller ones on pereopods 2 and 3.

TYPE LOCALITY

Japan (Usa - Inoshiri, Kochi).

REMARKS

These specimens as well as others from Japan have been previously assigned to *U. pugnax* de Man (Sakai, 1982, 1987). This is probably because de Man (1928) stated that the holotype of the latter species was a female but it is actually a

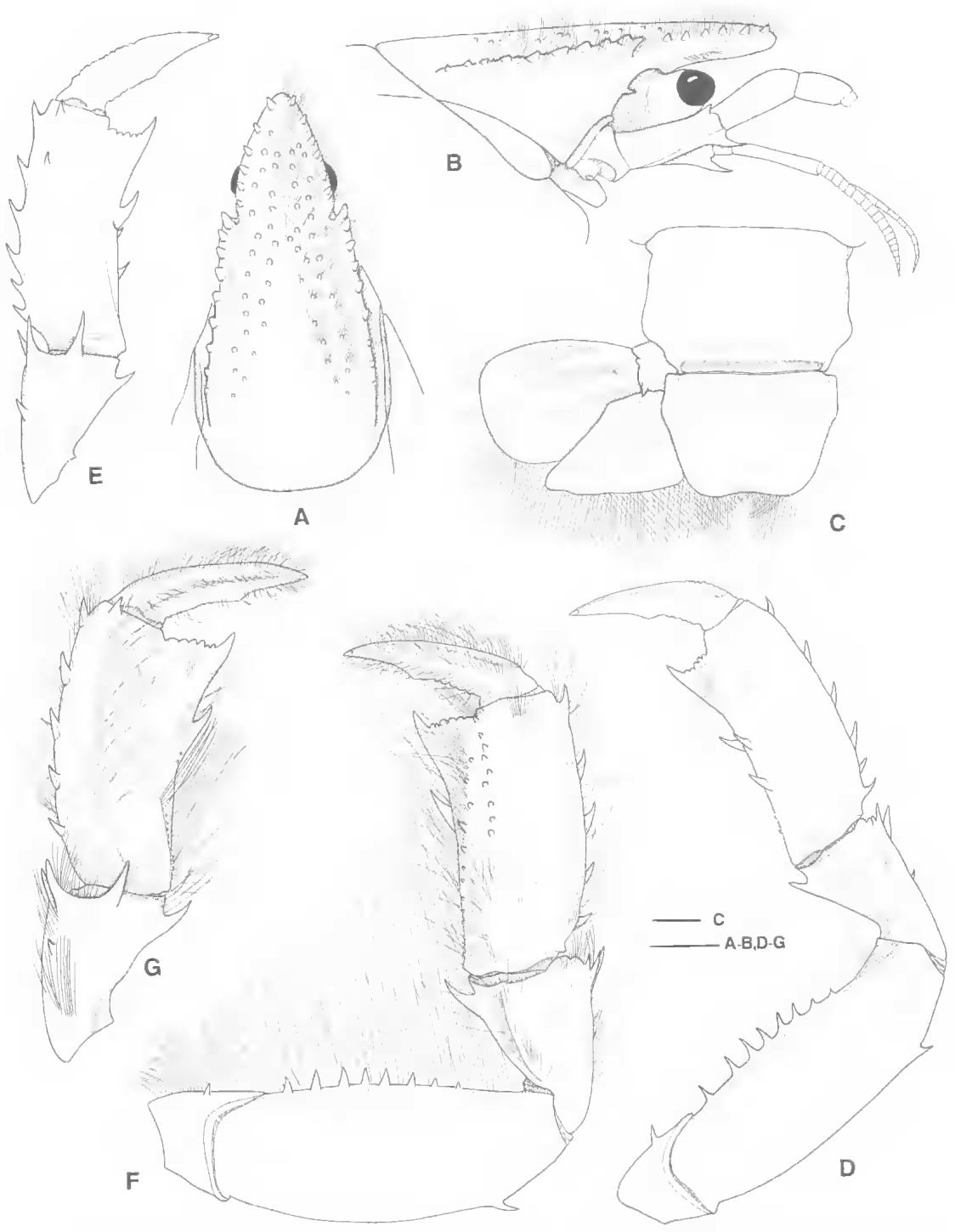

FIG. 7. *Upogebia sakaii* sp. nov. A-C, F, G, holotype, male, MNHNTh1262; D,E, female paratype, MNHNTh1263. A,B, anterior part of carapace, dorsal and lateral view; C, telson and uropod; D,F, pereopod 1, external view; E,G, distal part of pereopod 1, mesial view. Scale line: 1mm.

male. In the present new species, the females are similar to the holotype of *U. pugnax* but males differ by many features.

Two males of *U. pugnax* were described by Ngoc-Ho (1991) and an ovigerous female reported earlier in the present paper. *U. sakaii* and *U. pugnax* are very similar in the shape of the rostrum and the morphology and spinulation of all cephalic appendages. They differ by the following features: 1, epistome unarmed in *U. sakaii* but with a terminal spine in *U. pugnax*; 2, male pereopod 1 dimorphic in *U. pugnax*; 3, propod of male pereopod 1 distinctly broadened distally in *U. sakaii*; 4, in *U. sakaii*, the fixed finger of pereopod 1 is very short and the cutting edge level with the propod-dactylus articulation; in *U. pugnax*, the fixed finger is longer and the cutting edge projects beyond the propod-dactylus articulation; 5, *U. sakaii* has the dactylus of pereopod 1 with upper border unarmed or rarely denticulated proximally and with a low triangular tooth near the middle of the cutting edge; *U. pugnax* has the upper border completely denticulated and the cutting edge smooth; 6, telson with proximal border about 1.5 times broader than distal in *U. sakaii* but approximately the same in *U. pugnax*; 7, exopod of uropod with posterior margin slightly convex and postero-lateral corner rounded in *U. sakaii*; posterior margin more or less straight and meeting nearly at right angle with lateral margin in *U. pugnax*.

Upogebia savignyi (Strahl, 1862).
(Fig. 8)

Gebia sp. Savigny, 1817: pl.9, figs 3/2-2'.
Calliadne savignii Strahl, 1862: 1064.
Upogebia (Gebiopsis) rhadames Nobili, 1904: 235.
Upogebia (Calliadne) savignyi: Nobili, 1906: 98; de Man, 1927: 5, fig. 1; 1928: 47 (key).
Upogebia (Calliadne) rhadames: Nobili, 1906: 100; de Man, 1927: 6, pl.1, fig. 1; 1928: 47 (key); Sakai, 1975: 23, figs 6-8.
Upogebia (Upogebia) savignyi: Sakai, 1982: 14.; 1984: 154.
Upogebia (Upogebia) cargadensis: Sakai, 1982: 12 (in part, material from Kenya only, ZSM 1233/1 and ZSM 1233/2).

MATERIAL EXAMINED

North Kenya Banks, "Dr. Fridtjor Nansen" Cruise N° 1, Stn. 04, 16.2.1975, 02°30'S-40°56'E, 77m, in "green sponges": 1 ♂, cl. 12mm, tl. 30mm; 4 ♀ (1 ovigerous, 1 without abdomen), cl. 11.5-13mm, tl. 29-30mm (BMNH1993: 31.5); 10 ♂, cl. 5-7.5mm; 2 ♀, cl. 5.5-7mm (syntypes of *U. rhadames* Nobili, MNHNTh45).

DESCRIPTION

Rostrum sub-triangular, as long as broad at base, overreaching eye-stalk in male, shorter in female, with 6-8 small rounded tubercles on either lateral margin. Small round tubercles on rostrum and gastric region, with 23-25 on either gastric ridge; lateral groove long and narrow. Antero-lateral border of carapace unarmed; epistome rounded distally.

Telson sub-quadrate, c. 1.5 times as long as sixth abdominal segment, posterior border and lateral posterior angles rounded, faint and fine inverted U-shaped carina on dorsal surface.

Antennule and Antenna (Fig. 8C). With unarmed peduncle; antennal scale very small.

Maxillipeds. 1 (Fig. 8F), with exopod flattened distally bearing short and long setae, longer externally; 2 (Fig. 8G) with very small upright exopod; 3 without epipod.

Pereopod 1. Cheliform. Merus about 2.5 times as long as broad, 11-13 ventral spinules. Carpus unarmed; propodus unarmed except for 7-8 small teeth on proximal half of cutting edge of fixed finger. Dactylus slightly more than half length of propodus, bearing two dorsal proximal spiniform tubercles; mesial surface with longitudinal row of small round tubercles at mid-level and large, round proximal tooth near cutting edge.

Pereopod 2. Carpus with ventral subdistal spinule.

Uropod. Exopod slightly shorter than telson; posterior margin weakly convex; lateral angle rounded; proximal spine. Endopod trapezoidal. Basipod with posterior spine.

DISTRIBUTION

Suez, Red Sea, Gulf of Aden, Persian Gulf, Kenya.

REMARKS

Examination of the present material and the syntypes of *U. rhadames* Nobili (MNHNTh45) agree with Sakai (1982) that these two species are synonymous. Also belonging to *U. savignyi* are specimens from Kenya (ZSM1233/1, 1233/2), assigned by Sakai first to *U. rhadames* (1975) and later to *U. cargadensis* Borradaile (Sakai, 1982 with selection of a neotype). This neotype selected from sample ZSM1233/2 was refuted by Ngoc-Ho (1991) as not fitting Borradaile's (1910) original description.

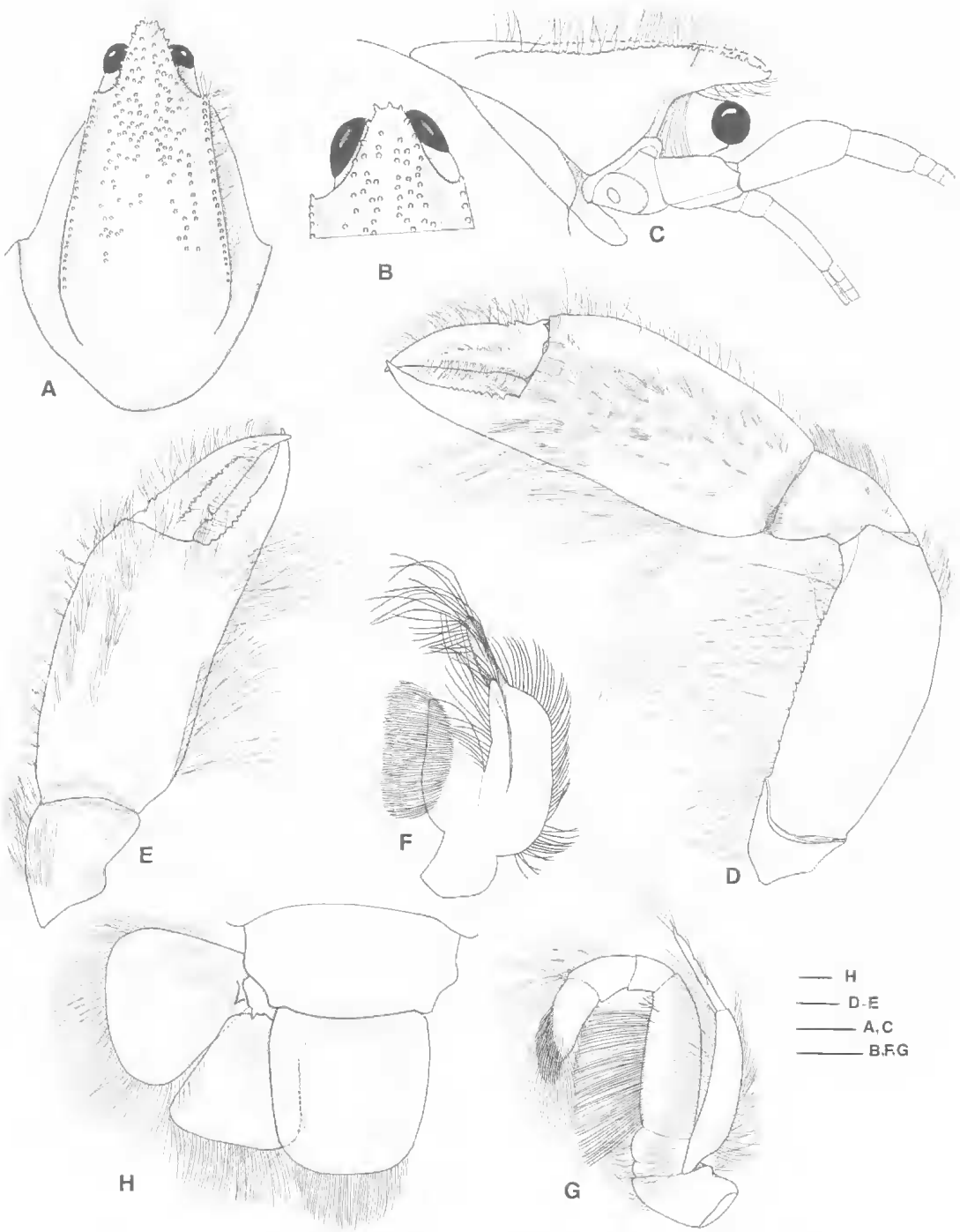

FIG. 8. *Upogebia savignyi* (Strahl). A,C-E,H, male, tl. 30mm; B,F,G, female without abdomen, cl. 13mm, BMNH1993:31.5; A-C, anterior part of carapace, dorsal and lateral view; D, pereopod 1, external view; E, distal part of pereopod 1, mesial view; F, maxilliped 1; G, maxilliped 2; H, telson and uropod. Scale line: 1mm.

There is some variation in *U. savignyi*: A, the triangular rostrum can be longer, equal, or shorter than the eye-stalk and is usually longer in males.; its tip can also be more or less pointed; B, in pereopod 1: ventral border of merus unarmed or with granules or denticles; carpus unarmed or with a ventral spinule; ventral border of propodus unarmed or with proximal denticles, dorsal border (rarely) with a distal spinule; C, posterior border of telson more or less rounded.

Diagnostic characters for the species are: 1, rostrum, gastric region and gastric ridges with numerous small tubercles; 2, linea thalassinica hardly visible posterior to cervical groove; 3, peduncle of both antennule and antenna unarmed; 4, maxilliped 1 without epipod, with exopod flattened distally, bearing setae of two lengths (Fig. 8F); maxilliped 2 with small upright epipod (Fig. 8G); maxilliped 3 without epipod; 5, Pereopod 1 cheliform; palm of propodus unarmed (with few exceptions), fixed finger with small teeth on proximal half of cutting edge; dactylus with a round mesial proximal tooth on cutting edge; 6, telson approximately quadrate, posterior border rounded; exopod of uropods with a proximal spine and basipod with a spine.

The morphology of the exopod of maxilliped 1 and the epipod of maxilliped 2 is unusual in the Upogebiidae. It has been reported in two other species: *U. tractabilis* (Hale) from Southern Australia (Ngoc-Ho, in press) and *U. stenorhynchus* Ngoc-Ho, 1991 from New Caledonia. Differences between the latter species and *U. savignyi* were given (Ngoc-Ho, 1991). Comparison of *U. savignyi* with *U. tractabilis* show certain similarities: 1, triangular shape of the rostrum; 2, peduncle of both antennule and antenna unarmed; 3, proximal spinule on exopod of uropod and another on basipod. Distinguishing characters are: 1, rostrum and gastric ridges bearing tubercles in *savignyi* but spinules or spiniform tubercles in *tractabilis*; 2, pereopod 1: merus unarmed or with a few spinules in *savignyi*, with spines in *tractabilis*; carpus unarmed in *savignyi*, with a ventro-distal spine in *tractabilis*; fixed finger cutting edge with small proximal teeth in *savignyi*, unarmed in *tractabilis*; dactylus with a proximal rounded tooth on cutting edge in *savignyi* but with 3-4 teeth medially in *tractabilis*; 3, telson with posterior border rounded in adults *savignyi*, with straight posterior border in adults *tractabilis*

Upogebia spinimanus sp. nov.
(Fig. 9)

TYPE MATERIAL

HOLOTYPE: Madagascar (Bombétoké Bay). Bastard coll.(no date): 1 ♂, cl. 5.5mm, tl. 14mm (MNHN Th790).

ETYMOLOGY

Referring to the large dorsal spine on the palm of pereopod 1.

DESCRIPTION

Rostrum sub-oval, projecting far beyond eyes; 6 small rounded teeth on either lateral margin; faint longitudinal median groove. Rounded tubercles postero-dorsally on rostrum, and on gastric region alongside lateral groove; lateral groove moderately broad. Gastric ridge with 10-12 small spiniform tubercles. Antero-lateral border of carapace with spinule. Cervical groove deep, bearing spine on either side near intersection with linea thalassinica, the latter extending to posterior margin of carapace. Epistome terminates dorsally in minute spinule.

Telson slightly broader than long, lateral border convex, postero-lateral angles rounded, posterior border nearly straight; very faint and small inverted U-shaped carina on dorsal surface.

Single pleurobranch on 5th thoracic segment in addition to arthrobranchs on maxilliped 3 and pereopods 1-4. Arthrobranchs with 2 tubular lamellae on either side of the rachis.

Antennule (Fig. 9B). First peduncular article with ventral distal spinule.

Antenna (Fig. 9B). Third peduncular article with ventral distal spinule; scale terminating in small flap extending to base of fourth article.

Maxillipeds. 1-3 with epipod, that of maxilliped 1 very small.

Pereopod 1. Subcheliform. Ischium with ventral spine. Merus about 3 times as long as broad, bearing dorsal subdistal spine and 3-4 ventral spines. Carpus with ventral distal spine, fine longitudinal groove on upper part of external surface; mesial surface with dorsal distal spine and spine near middle of distal margin. Propodus over 2.5 times as long as broad, carrying large spine near distal third of dorsal margin; fixed finger slender, about 1/3 as long as dactylus, cutting edge denticulated. Dactylus approximately 2/3 as long as propodus, with small corneous tip, unarmed.

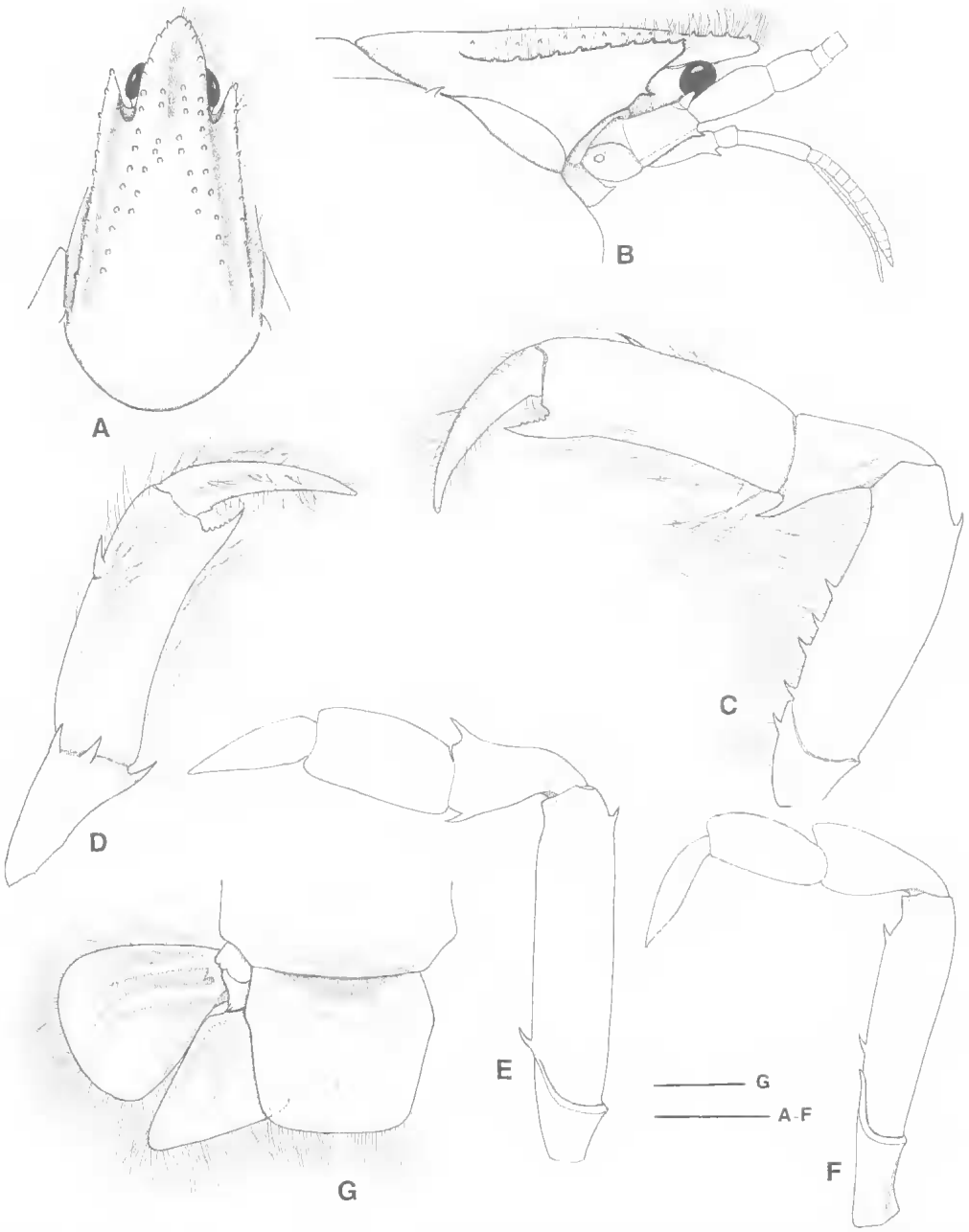

FIG. 9. *Upogebia spinimanus* sp. nov., holotype, male, MNHNTh790. A,B, anterior part of carapace, dorsal and lateral view; C, pereopod 1, external view; D, distal part of pereopod 1, mesial view; E,F, pereopods 2 and 3 respectively; G, telson and uropod. Scale line: 1mm.

Pereopod 2. Merus with dorsal subdistal, and ventral proximal spine. Carpus bearing dorsal, and ventral subdistal spine.

Pereopod 3. Merus with 2 spines on ventral margin.

Uropod. Exopod hardly longer than telson, posterior border and lateral external angle

rounded, with spinule proximally; endopod approximately trapezoidal, protopod with spinule.

TYPE LOCALITY
Madagascar (Bombétoké Bay).

REMARKS
The possession of a pleurobranch on the 5th thoracic segment places *U. spinimanus* sp. nov. within a special group of *Upogebia* which is dealt with in detail in another work (Ngoc-Ho, in press). Included are: *U. africana* (Ortmann, 1894); *U. allobranchus* Ngoc-Ho, 1991; *U. capensis* (Krauss, 1843); *U. giralia* Poore & Griffin, 1979; *U. lenzrichtersi* Sakai, 1982; *U. stellata* (Montagu, 1808).

U. spinimanus is most similar to *U. lenzrichtersi* also from Madagascar, and was compared with paratypes of the latter species in the Paris Museum (MNHNTh519, 520). The two have similar rostrums, telsons and uropods; both have a dorsal spine on the propodus of pereopod 1; both have coxal spines on pereopods 1-3. They can be separated by: 1, lateral shoulder of cervical groove with spine near intersection with linea thalassinica in *U. spinimanus* (spine absent in *U. lenzrichtersi*); 2, antennular and antennal peduncle with a ventral spine on first and third article in *U. spinimanus* (unarmed in *U. lenzrichtersi*); 3, male pereopod 1: *U. spinimanus*: merus with 3-4 ventral spines; propodus without dorsal carina behind dorsal spine, ventral margin unarmed; dactylus unarmed (*U. lenzrichtersi*: merus unarmed ventrally, or with tubercles; propodus with dorsal carina on proximal two-thirds and large mesial ventral spine near base of fixed finger; dactylus with dorsal tubercles and small round teeth on cuting edge); 4, pereopods 2 and 3 with 1-2 ventral spines in *U. spinimanus* but unarmed ventrally in *U. lenzrichtersi*.

Wolffogebia Sakai, 1982

REMARKS
Wolffogebia Sakai, 1982 was established for 4 species: *W. phuketensis* Sakai, 1982 (type species); *W. inermis* Sakai, 1982; *W. obtifrons* Sakai, 1982; and *Gebicula exigua* Alcock, 1901. Sakai gave the following diagnosis: "Dorsal surface of anterior region with a median carina. Lateral frontal process of carapace developed. Lateral longitudinal groove definable. Antero-lateral margin of carapace armed or unarmed. First pereopod subchelate."

It is questionable whether *Gebicula exigua* (also the type species of *Gebicula* Alcock, 1901) really belongs to *Wolffogebia*. This species was considered by Sakai (1982) to be a senior synonym of *Upogebia monoceros* de Man but his action was thought doubtful by Ngoc-Ho (1989) who assigned *U. monoceros* to the genus *Gebiacantha*. The holotype (a female of 15mm in total length), and only existing specimen of *Gebicula exigua*, is deposited in the Indian Museum and unavailable for examination at present. The original figure in Alcock (1901) is in lateral view and the dorsal surface of the rostrum and anterior region of the carapace are not shown. It is impossible to confirm whether the specimen possesses the first three characters given by Sakai (1982) in the diagnosis of *Wolffogebia*. However, the figure shows the antero-lateral margin of the carapace bearing at least 2 spines, which is in contradiction with the type-species of *Wolffogebia*, *W. phuketensis*, which has this border unarmed (Sakai, 1982: fig. 18c). The two characters "unarmed antero-lateral border of the carapace" together with "p1 subcheliform" displayed by *W. phuketensis* are uncommon in the Upogebiidae. Until the holotype of *Gebicula exigua* can be examined, it is not possible to know whether this deep-sea species (captured at 485m depth) belongs to *Wolffogebia*. If it does, *Wolffogebia* would become a junior synonym of *Gebicula*. *Wolffogebia* and *Gebicula* are here provisionally retained as separated genera pending a future study of *Gebicula exigua*.

Characters given as diagnostic of *Wolffogebia* by Sakai (1982), are cited above. Those relating to the lateral frontal process of the carapace, the lateral longitudinal groove and the antero-lateral margin of the carapace are not precise enough to be useful as they belong to the great majority of upogebids, and roughly half of them actually possess a subchelate pereopod 1.

Wolffogebia species form a distinctive group within the Upogebiidae. Examination of the type species, as well as *W. inermis* reveals a number of morphological features which help to better define it. They are: absence of a median longitudinal groove on rostrum; dorsal surface of anterior region with a slight median carina; antero-lateral border of carapace unarmed; arthrobranchs with a single series of large lamellae on either side of the rachis; maxilliped 1 with a large epipod; maxilliped 2 with exopod of one article, without flagellum; maxilliped 3 without epipod, exopod without flagellum; pereopod 1 subcheliform.

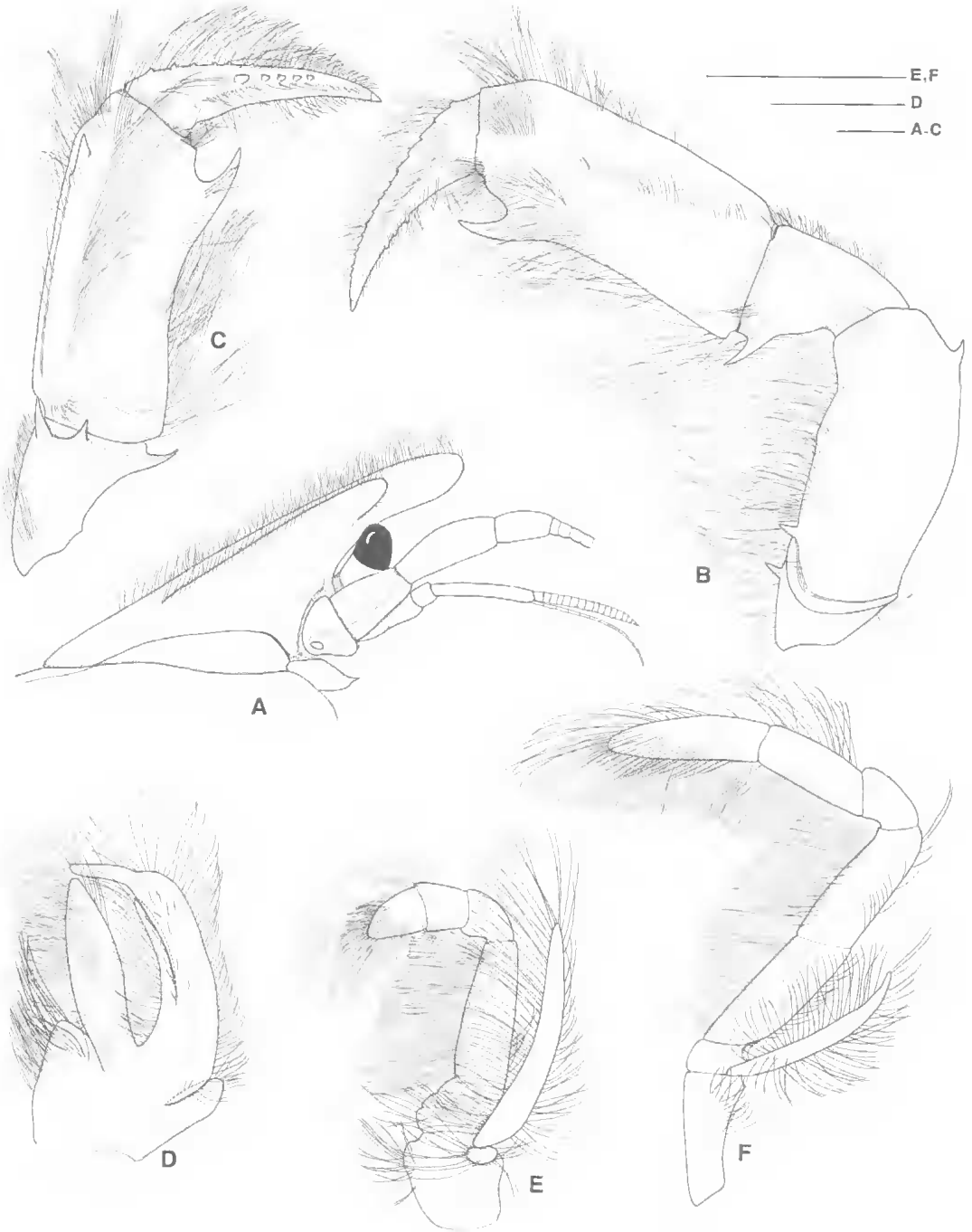

FIG. 10. *Wolffogebia inermis* Sakai. A-C, male, tl. 27mm, BMNH1993:30.2; D-F, female, tl. 27mm, MNHNTh 1279. A, anterior part of carapace, lateral view; B, pereopod 1, external view; C, distal part of pereopod 1, mesial view; D-F, maxillipeds 1, 2 and 3 respectively. Scale line: 1mm.

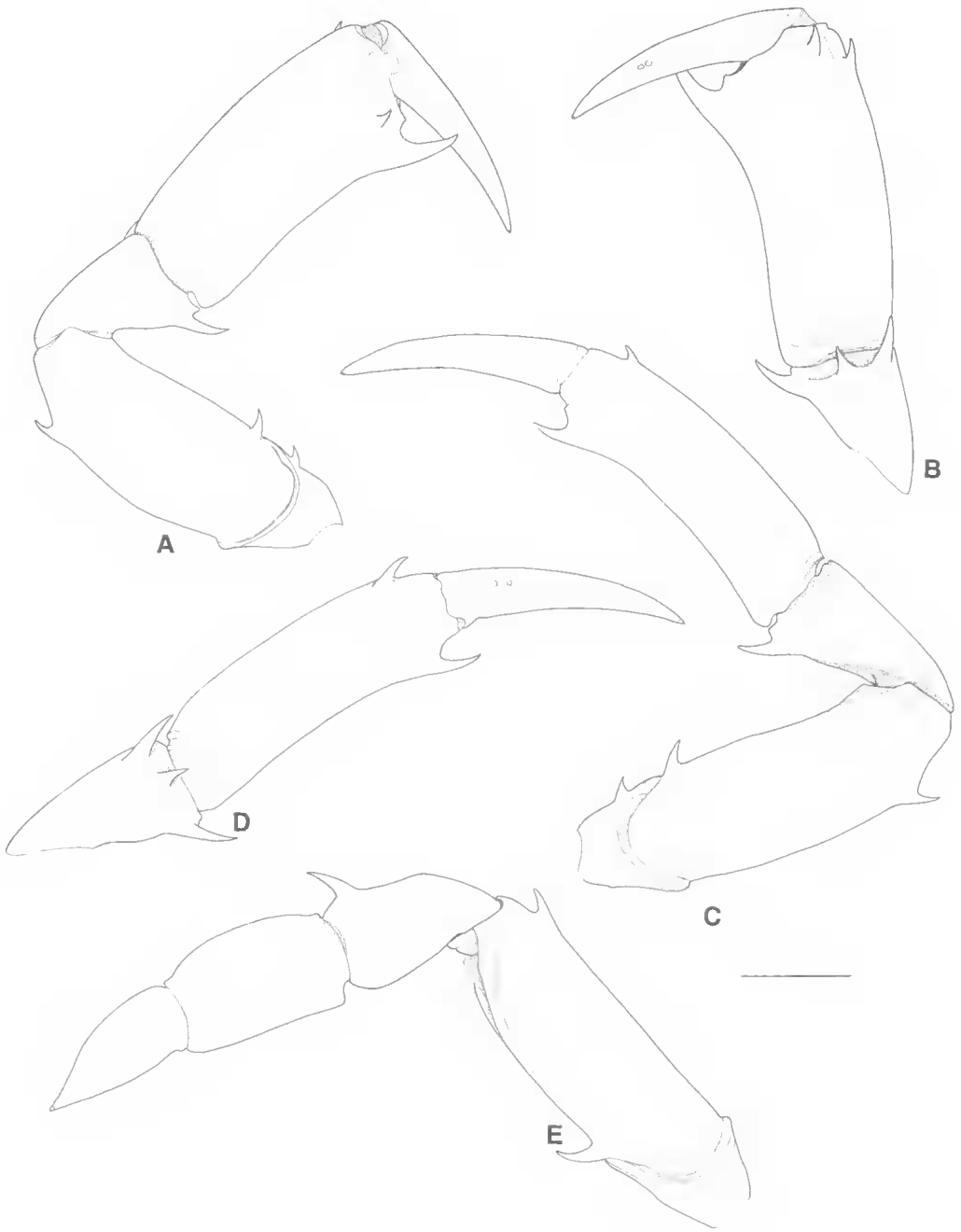

FIG. 11. *Wolffogebia inermis* Sakai. A,B, male, tl.21mm, MNHNTh1279; C-E, female, tl.27mm, MNHNTh1279. A,C, pereopod 1, external view; B,D, distal part of pereopod 1, mesial view; E, pereopod 2, external view. Scale line: 1mm.

In combination with the characters "anterolateral border of carapace unarmed" and "pereopod 1 subcheliform", the morphology of maxillipeds, especially exopods without a flagellum in maxillipeds 2 and 3, is uncommon in the Upogebiidae.

Wolffogebia inermis Sakai, 1982
(Fig. 10)

Wolffogebia inermis Sakai, 1982: 81, figs 17c, 18g, 19a-b, pl. G6; 1993: 109, figs. 12-14

MATERIAL EXAMINED

Can-gio (Ho-chi-Minh city), Vietnam, Tran phi Hung coll., 1.5.1993, mangrove area, in mud: 5 ♂ (4 juv.), cl. 4.5-7mm, tl. 14.5-22mm, 3 ♀ (2 ovig.), cl. 7.5-8mm, tl. 27-28mm (NMHNTh1279); no locality data: 2 ♂, cl. 8mm and 11,5mm, tl. 21,5mm and 27mm; 1 ♂, 1 ♀ damaged, 1 male P1 (BMNH1993.30.2).

DESCRIPTION

Rostrum elongate, with rounded tip projecting far beyond eye, setose but unarmed, as are gastric region and gastric ridge. Lateral groove narrow; antero-lateral border of carapace unarmed. Cervical groove moderately deep, linea thalassinica faint posterior to it. Epistome terminating in spinule. Arthrobranchs with single series of large lamellae on either side of rachis.

Antennule and Antenna (Fig. 10A). Both peduncles unarmed, antennal scale minute.

Maxillipeds 1 (Fig. 10D), with large epipod; 2 (Fig. 10E), with simple exopod, without flagellum; 3 (Fig. 10F), without epipod, exopod simple in large specimens, with short indifferentiated flagellum in juveniles.

Pereopod 1. Subcheliform, sexually dimorphic. Ischium with ventral spine. Merus with dorsal subdistal, and ventral proximal spine. Carpus bearing large ventral distal spine; external surface with faint longitudinal groove on upper half; mesial surface carrying dorsal distal spine and another near middle of distal border. Propodus in males over twice as long as broad at mid-length, more slender in females; mesial surface with fine longitudinal dorsal carina in adult males, smooth in juveniles and females, all with large dorsal subdistal spine; fixed finger subdistal, unarmed. Dactylus in adult males three-quarters as long as propodus, with corneous tip and denticles on dorsal margin, external surface with 0-6 round tubercles near cutting edge, mesial surface with longitudinal row of 2-6 teeth or tubercles on upper half; dactylus unarmed in juveniles and females except for 1-3 small mesial tubercles.

Pereopod 2. Merus with dorsal subdistal and ventral proximal spine; carpus with dorsal subdistal spine.

DISTRIBUTION

Indonesia (Java, Mocara Tangerang), Vietnam (Can-gio).

REMARKS

Sakai (1982) stated that the holotype (♂, 34mm tl., from Java, Mocara, Tangerang) and sole specimen was deposited in the Zoölogisch Museum-Universität van Amsterdam, but there is no record of it there, nor in the Zoologisches Institut-Universität Hamburg (D. Platvoet & G. Hartmann, pers. comm.).

The present material agrees well with the description and figures of the holotype especially in the absence of all spines or tubercles from the carapace. Pereopod 1 is slightly more slender in this material; in adult males, the dactylus bears denticles on the dorsal margin, external tubercles near the cutting edge, and a row of 2-6 teeth or tubercles on the mesial surface. The dactylus of P1 on the holotype has both the dorsal margin and the cutting edge unarmed and only a single mesial tooth is present (Sakai, 1982: fig. 20E). Another variation concerns the right P1 of a male from Vietnam of 22mm tl. which is larger than the left and armed with an external subdistal spine near the base of the fixed finger, and a mesial subdistal spine near the base of the dactylus (Fig. 11A, B). These spines are not reported in the holotype and absent in the rest of the material examined.

Females studied also agree well with the specimen recently described by Sakai (1993: fig. 13b,c) (ovig. ♀, 30mm tl., from Darwin, Australia) except that in the Australian specimen, the exopods of both maxillipeds 2 and 3 are provided with a flagellum. It is questionable whether there was a mistake.

Wolffogebia phuketensis Sakai, 1982
(Fig. 12)

Wolffogebia phuketensis Sakai, 1982: 75, figs 17a, 18c-d, 20b

MATERIAL EXAMINED

HOLOTYPE. Phuket, Thailand, ♂, tl. 39m (UMK type collection).

OTHER MATERIAL: Northwestern Singapore, in mangrove, in burrows of *Thalassina anomala* mound.

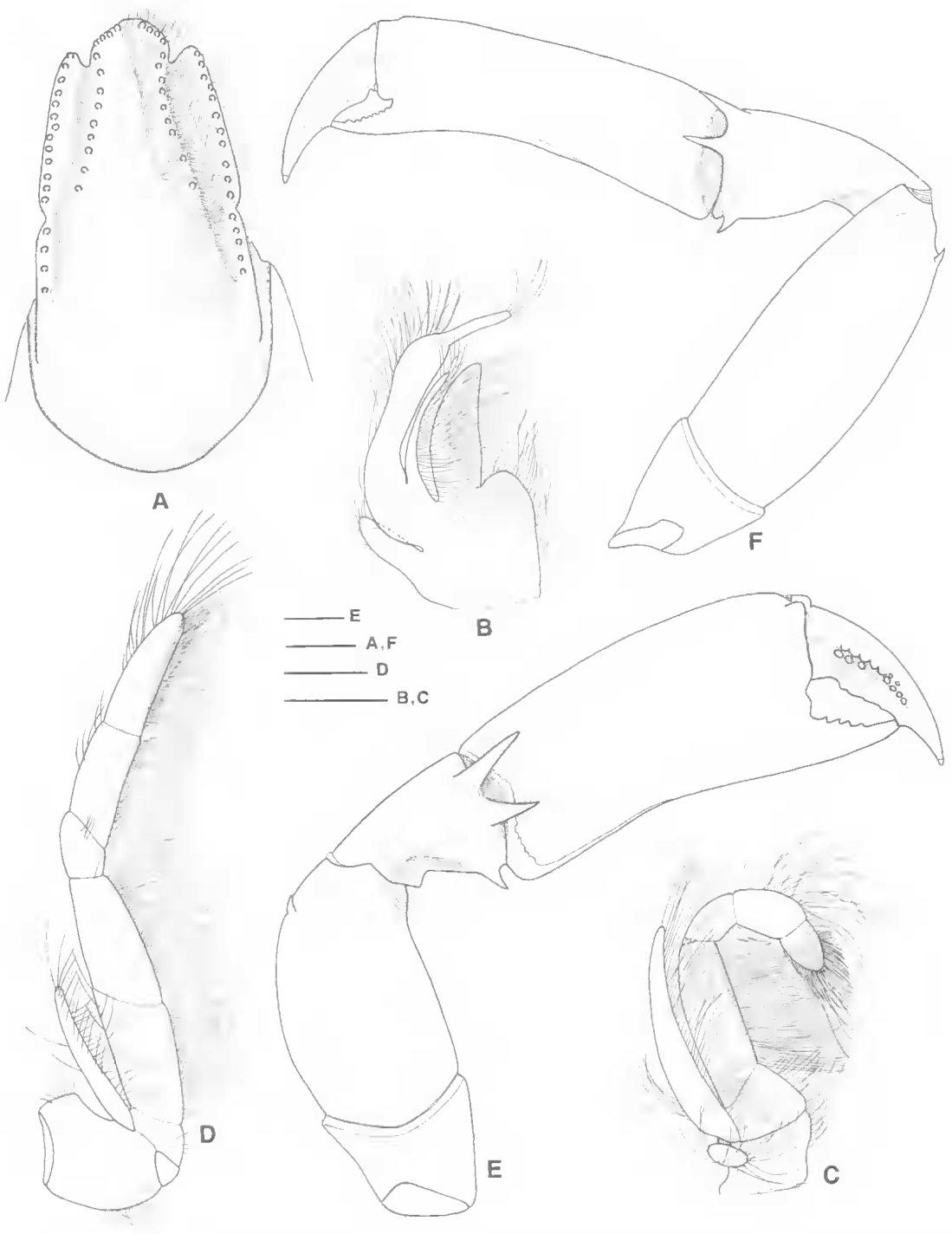

FIG. 12. *Wolffogebia phuketensis* Sakai, QMW14854. A-D, ovig. female, tl. 34mm; E, male; F, female tl. 25.5mm. A, anterior part of carapace, dorsal view; B, maxilliped 1; C, maxilliped 2; D, maxilliped 3; E,F, pereopod 1, mesial view. Scale line: 1mm.

P. Davie & P. Ng coll., 6.9.1987: 2 ♀ (1 ovig.), cl. 8.5mm and 10mm, tl. 25.5mm and 34mm; 1 ♂ without abdomen, cl. 13mm (QMW14854).

DESCRIPTION

Rostrum low, triangular, about half as long as wide at base in females, longer in male, projecting slightly beyond eyes, with 4 round teeth laterally; dorsal surface without median longitudinal groove, very setose. Gastric region setose laterally with 8-9 round tubercles alongside either lateral groove; medially with a non setose area the anterior part of which slightly elevated in the shape of a weak carina pointing forwards. Lateral groove moderately deep; lateral ridge with small median notch, carrying 12-13 and 4-5 round tubercles on anterior and posterior half respectively. Anterolateral border of carapace unarmed. Cervical groove deep, linea thalasinica invisible posterior to it. Arthrobranchs with single series of large lamellae on either side of the rachis.

Antennule and Antenna. Peduncle unarmed.

Mandible. Without antero-mesial tooth.

Maxillipeds. 1 (Fig. 12B) with large epipod; 2 (Fig. 12C) with single article on exopod, without flagellum; 3 (Fig. 12D) without epipod, exopod without flagellum.

Pereopod 1. Subcheliform, stouter in male than in female. Merus with dorsal subdistal spine. Carpus with a ventral subdistal, and 2 large mesio-distal spines. Propodus about twice as long as broad at mid-length in male, over 3.5 times in female, palm unarmed, fixed finger with small teeth on proximal two-thirds of cutting edge. Dactylus with weak longitudinal mesial tuberculate crest and a few tubercles in male, unarmed in female; cutting edge bearing 2-4 minute teeth.

Pereopod 2. Merus with dorsal subdistal and ventral proximal spine.

DISTRIBUTION

Thailand (Phuket Island); Singapore.

REMARKS

The specimens examined agree closely with Sakai's description and figures and with the holotype of *Wolffogebia phuketensis*. The exopods of both maxillipeds 2 and 3 are clearly simple (Fig. 12C,D) The external view of male pereopod 1 was given by Sakai (1982), the mesial view of the same appendage in both male and female is provided (Fig. 12E,F).

ACKNOWLEDGEMENTS

The author wishes to thank the Natural History Museum, London (Paul Clark), the National Taiwan Ocean University (Tin-Yam Chan), The Nationaal Natuurhistorisch Museum, Leiden (Charles H.J.M. Fransen), the Queensland Museum, Brisbane (Peter Davie), the Universitetets Zoologiske Museum, Kobenhavn (Dr Torben Wolff), the Zoologische Staatssammlung, München (Dr L. Tiefenbacher) for kindly making material available for examination, Peter Davie and Michèle de Saint Laurent for their helpful comments on the manuscript.

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